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Digital Mapping, Charting, and Geodesy Analysis Program: Technical Review of Additional Military Layers (AML) Draft Product Specification for NATO Review, Edition 2.0

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The Additional Military Layers (AML) product being developed under the North Atlantic Treaty Organization (NATO) is intended to supply supplemental digital cartographic information to standard Electronic Nautical Chart (ENC)/Digital Nautical Chart (DNC) products to increase military applications utility. The AML contains six draft product specifications as defined by their thematic layers:

- maritime foundation and features
- routes, areas, and limits
- contour lines bathymetry
- high-resolution environment
- large bottom objects
- small bottom objects.

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DMAP Technical Review of the

Additional Military Layers (AML)

Draft Product Specifications for NATO Review, Edition 2.0

The Digital Mapping, Charting, and Geodesy Analysis Program (DMAP) team has reviewed the Additional Military Layers (AML) Draft Product Specifications for North Atlantic Treaty Organization (NATO) Review.

Background

AML is intended to supply supplemental digital cartographic information to standard Electronic Nautical Chart (ENC) / Digital Nautical Chart (DNC) products to increase military applications utility. The AML contains six draft product specifications as defined by their thematic layers:

- Maritime Foundation and Features
- Routes, Areas, and Limits
- Contour Lines Bathymetry
- High Resolution Environment
- Large Bottom Objects
- Small Bottom Objects

General Comment

Unfortunately there were unanticipated delays in receiving the document for review. However, working within the given time constraint we feel that we have noted the major points of interest from the DMAP vantage point.

The overall document quality is excellent. DMAP wishes to compliment the authors on the quality of their work, both in content and thoroughness of typographic expression. No textual, spelling, grammatical, or punctuation errors were noted.

VRF/VPF vs S-57

During our last review[1] of AML, we pointed out the need for compatibility of AML with Vector Product Format (VPF) products, specifically DNC, Tactical Ocean Data (TOD), and Littoral Warfare Data (LWD). It was noted in this review that half of the themes now provide for a "dual" output format, S-57 (International Hydrographic Office (IHO)

[1] NRL DMAP Technical Review, *A Discussion of Issues Related to the Additional Military Layers (AML) NATO Product Set Model*, Mesick, H., and Carter, S., December 3, 1999

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Transfer Standard for Digital Hydrographic Data) and VPF. The following table indicates our present understanding of the document in this regard.

AML Theme	Supports VPF/DIGEST
Maritime Foundation and Facilities	No
Routes, Areas, and Limits	No
Large Bottom Objects	Yes
Contour Lines Bathymetry	Yes
High Resolution Environment	No
Small Bottom Objects	Yes

DMAP would like to recommend that all themes support both output formats, S-57 and VPF.

DMAP wishes to continue to emphasize the need to maintain compatibility between the AML (S-57) feature and attribute codes and the Digital Geographic Information Exchange Standard (DIGEST) feature and attribute codes. This need is emphasized by the historical difficulty in trying to interchange features and attributes between DNC and ENC.

Since the AML specifications are not fully developed at present, now is the time to assure that features and attributes will map from one coding standard to the other in an unambiguous manner. Because most of the AML features are "new" and not presently in DIGEST, this should minimize any compatibility problem, provided the appropriate feature and attribute codes are added to the DIGEST standard.

Water Column Profile and Temporal Variability

During recent preliminary investigations with the Naval Oceanographic Office in the definition of possible Mission Specific Data Sets (MSDS), it was found to be beneficial to include information about the water column at specific locations (examples being temperatures, salinity, density, and sound speed profiles). No effective method was found to store this type of information in the VPF format.

An alternative method was explored using object-oriented database techniques. DMAP, while not as familiar with the S-57 / ISO 8211 format as VPF, would expect similar problems in the storage and manipulation of "profile" data in conjunction with conventional cartographic features. This being the case, it is suggested that consideration be given to methods for the storage and manipulation of water column profile data within the AML specification.

In addition to "profile" data, a similar situation exists for information that exhibits temporal variability (e.g., annual variability in water clarity or visibility, sea ice, or other physical properties that exhibit regular seasonal variability). Thus, in additional to

"profile" data, temporal variability should also be given consideration within the AML specification.

Large and Small Bottom Objects

The review of Large and Small Bottom Object features was accomplished by examining the data definitions currently used by the Naval Oceanographic Office (NAVOCEANO) and Commander Mine Warfare Command (COMINEWARCOM). In doing so, the primary emphasis of the review was to look for 1) the scale used to define a range of small versus large objects, and 2) the matching of feature content as it is used to distinguish between the objects included in the Prototype AML Specification and any database definitions currently in use by these commands. Specifically, NAVOCEANO currently maintains the Master Contacts DataBase (MCDB) to describe bottom features identified during survey operations. The feature content definitions that are found in this data were examined to determine their correspondence to the AML specification. COMINEWARCOM uses similar definitions in its NATO Military Oceanography (MILOC) Mine Warfare Working Group (MWWG). Most object definitions seem to be very similar in format and content, however the predominant difference is one range of size.

In general, the definitions used to describe a range for large and small bottom objects are not definitive in scale. Rather the definition of small bottom object as examined among different departments at NAVOCEANO seems to describe a range of features that can vary in length from about ½ meter to 10 meters. Although specific boundary ranges are not readily available, the term large bottom objects is generally reserved for defining objects similar to a sunken vessel and can range in excess of 100 meters in length. While ranges may vary, the predominant scale of ±5meters represented in the AML Specification seems to agree in a manner that would allow both NAVOCEANO and MIW communities to represent bottom features in a consistent manner.

Likewise, the data content definitions used by these groups seems to address the need for defining height, width, length, depth, and orientation as the primary entities associated with the positional data of a bottom object. Both the data definitions found within NAVOCEANO MCDB and those defined by the MWWG can be adequately represented by the AML Specification. Since each of the communities refer to the Vector Product Format and/or Digital Nautical Chart formats as the base specifications for disseminating this type of data, it is expected that the definitions for Large and Small Bottom Objects found in the AML Specification are adequate to store U.S. Naval data descriptive of these data features.

Recommendations

- Ensure all AML themes support VPF / DIGEST standards.
- Consider methods to store and manipulate water column profile data and information with seasonal or temporal variability.

Summary and Conclusions

AML specification development is on track and is coming close to meeting the needs of its intended use. DMAP is pleased to see the inclusion of VPF as an output format as this provides compatibility with other NIMA digital cartographic products. However, with the increasing need to include nontraditional cartographic features such as sound speed profiles, beach gradient cross sections, imagery, and features with temporal variability, it is doubtful that the current data formats employed will be robust enough to meet this challenge.

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